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ABSTRACT

The series of research studies contained in this project emphasize the central position of the learning process in research into teaching. The main studies under the project were based on four sets of material collected in the course of three academic years. A number of supplementary collections and processings of other material were also undertaken. The first set of material was connected with thirty students of education who took part in a learning experiment and whose studies were followed for one term. Similar observations were made of twenty-nine social science students for a complete academic year. These students also took part in two learning experiments, and their data provided the second set of material. During the third year, two experimental studies were made of more wide-ranging attempts to influence the learning process. These two sets of material were collected outside the students' normal studies. Three specific questions are answered by the following results: (1) Qualitative differences of knowledge can be observed and described and are seen as the decisive differences in the understanding and retention of learning material. (2) Study skill, interpreted as the combination of an activity in relation to a situation and the outcome of that activity in the form of knowledge, can be observed and described. (3) The best way of influencing study skill is by influencing the cognitive attitude during the learning process. (JMF)

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Background and purpose

This project represents a research approach emphasizing the central position of the learning process in research into teaching. One reason for mounting the project was the lack of research into the everyday conditions of teacher and student. The studies included in the project are intended to shed light on three questions. These were set out in the order it was felt they should be raised - in other words the answer given to a preceding question is a contributary prerequisite if an answer is to be given to the next question.

1. What fruitful way is there of observing and describing knowledge?
2. How can study skill be observed and described?
3. How can study skill be influenced?

These questions are asked in a particular context, viz university studies. The survey population is made up of undergraduates In the academic subjects covered by the studies in the project, learning entailed the processing of a relatively large quantity of reading matter.

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The questions are of a highly general nature and require answering in all educational activities. In view of their general nature, the problems selected are hardly likely to appear specific to the university sector, but they are nonetheless fundamental problems in that sector.

The first two questions, which have to be answered in order for an answer to be given to the third, are questions of theory and of research method. They refer both to the meaning of knowledge and study skill and to the means by which this meaning is elucidated. Thus problems of method have occupied a prominent position in the project.

Conduct

The main studies under the project were based on four sets of material collected in the course of three academic years. A number of supplementary collections and processings of other material were also undertaken. The first set of material was connected with thirty students of Education who took part in a learning experiment and whose studies were followed for one term. Similar observations were made of twenty-nine Social Science students for a complete academic year. These students also took part in two learning experiments, and their data provided the second set of material. During the third year, two experimental studies were made of more wide-ranging attempts to influence the learning process. These two sets of material were collected outside the students' normal studies.

The first of the initial questions stated above was considered with reference to all four sets of material, primarily in connection with the learning studies. The second question was given closest consideration in connection with the non-experimental parts of the first two sets of material (including the learning experiment in the first set of material). Apart from question one, the experiments also concerned question three in that they concerned attempts to influence the cognitive attitude to the learning material, which was regarded as the central component of study skill.

The following account starts with a description of the four main collections of data during the three academic years comprising the data collection phase of the project. This is followed by a presentation of the methods of analysis and results obtained through the analysis of these data, reference being made to the reports in which more detailed accounts have been given.

Collections of data

Collection during 1970/71

Thirty students of Education , first year students at the University of Göteborg, were followed during the autumn term. Data were collected on three occasions at five-week intervals. On these occasions a learning experiment was conducted which covered all three occasions. The experiment occupied most of the time and constituted the major proportion of the data.

The relation between the three occasions within the learning experiments was founded on the relation between two texts. One of these was issued to the students on the first occasion. After reading the text, the students were asked to recount it, they were given questions on the content and they were asked how they had read the text and how they had gone about remembering its content. On the second occasion they were asked to recount as much as they could recall of the first text. They were then given the second text to read, whereupon the same observations were made as for the first text. The second text was a revised and enlarged version of the first, and it contained the entire substance of the latter. We consider the text material to be relatively representative of a great deal of the set reading in Education. The texts given were not on the reading list for that term.

In addition to the learning experiment, data collection on the three occasions included interviews concerning the students' normal studies. The students were asked how much work they had done, in terms of time input and the amount of literature covered, and they were asked how they studied and what attitude they took to studies, tuition and examinations. Particulars were collected concerning examination results, and the students also took a test constructed as part of the project and covering the whole of their 20-credit course. Data were collected individually and orally, except for the test being a written one. Even the test was taken individually and with the leader of the experiment present.

Collection during 1971/72

Twenty-nine Social Science students were followed during the academic year 1971/72. Two learning experiments were conducted in connection with their studies, one in Political Science and the other in Economics (which, together with Sociology, were the constituent subjects of the Social Science course). The learning experiments accounted for the greater part of data collection.

The experiments implied attempts to influence learning activity. In the first experiment, half the group were given questions by the experimental leader on particular points in the text, while the other half did not receive any such questions. In the second experiment, half the group were given instructions as to how they should read, while the other half were not given any such instructions. The group was independently halved in each experiment. After they had read through the text, the students freely recounted what they had read and were asked questions on the content, both immediately after reading and after about 65 and 85 days respectively. They were also asked how they had read the text and how they had gone about remembering its content.

The subjects were interviewed four times during the academic year concerning the studies not covered by the experiments, and they answered questions concerning time input, the amount of set literature they had covered, their way of reading and their attitude to their studies. A general written examination in Political Science was constructed and particulars were collected concerning all

examination results. A written "learning test" was also set at the beginning and end of the academic year.

Activities were arranged on different lines from the previous year because the learning experiments formed part of the students' normal studies in the sense that they involved the reading of set literature. The two learning situations included bore no direct relation to one another - unlike the first set of material - but they were interrelated via the courses of which they formed part.

Collections during 1972/73

During the autumn of 1972, two experiments were conducted which represented a continuation and an extension of these included in the data collection activities during 1971/72. The students were not studying the academic subject to which the learning material was referable. They were first year students, but their normal studies were not covered in the same way as in the previous collections of data.

One of the experiments concerned the possibility of influencing continuing learning activity via the design of questions on a set text. At a more general level it was concerned with the steering effect of examination on learning strategy.

Forty students were divided between two situations. Both groups read three chapters of a textbook. After the first two chapters they were given a number of questions on the content which were intended to influence them in favour of a certain type of learning. One group were given conventional exam questions of the "factual" type. The other group were given questions which focussed on their understanding of the content of the text. The latter group were also asked to recount the text in their own words. After they had read the third chapter, both groups were given both types of question. After about 45 days, retention was measured by means of recapitulation and answers to all the questions asked previously.

In the second experiment, use was made of portions of an Economics text which was also included in the second year's collection. Forty students were divided into an experimental group and a control group. In connection with their reading of the first half of the material (part 1), the twenty members of the experimental group were subjected to attempted influence via instructions, preparation of the text and subsequent questions on the content. The text preparation consisted of supplementary questions in the margin based on the mistakes made by the previous students (during the 1971/72 collection). These questions were intended to concretize and lead to the activity called for in the instructions. The answering of the subsequent questions was intended to presuppose intelligent learning. The conditions of the experiment may be described as a "miniature course" in study skill. The control group also read the first half of the material and replied to the subsequent questions, but they were not given a prepared text, nor were they given the same instructions as the experimental group.

Together the two groups then read the second half of the material

and were asked follow-up questions of the same kind as had followed part 1. Learning conditions were now the same in both groups, and learning and outcome measurement were intended to constitute a test of the effects of different conditions surrounding the learning of part 1. After the second learning, the students were asked questions concerning the way in which they had read and apprehended different parts of the text.

Retention of both parts was tested after about 45 days. On this occasion the students were also asked more generalized questions concerning study habits and educational attitudes.

Processing

Most data were collected by interviewing the students. The interviews were tape-recorded and then transcribed. The project material consisted primarily of these transcripts. Examination results and the results of a number of written tests and a questionnaire provided supplementary data in the first two sets of material. Processing took place to a great extent at individual level, i.e. it entailed the analysis and description of data referring to individual students. Otherwise processing is presented as part of the results.

Results

1. What fruitful way is there of observing and describing knowledge?

This fundamental question was dealt with in all learning studies during the project (reports 11 to 21). In these studies it was shown that qualitative differences of knowledge can be observed and described. This was shown in relation to different cognitive contents and in relation to texts dealing with these different cognitive contents. These qualitative differences, differences in the conception of cognitive content and message, have been seen as the decisive differences in the understanding and retention of learning material.

The 'students' conception of a particular item of subject matter (a message, a concept, a problem) was analysed and classified. In all cases this yielded a limited number of categories of conception (and misconception). Intuitively and logically, the variation between conceptions was considered to be the most important difference in knowledge between the students in relation to content (the message, the concept, the problem). There were also results of a more general nature (via content) concerning the qualitative differences.

The majority of categories in each contentual unit (message, concept, problem) were found to be hierarchically interrelated. This meant that the better conceptions (higher level) were more complex and expressive of more abstract thought than the inferior conceptions (lower level). The higher levels incorporated counterparts of the lower levels as parts of a more complex conception. In many cases conception also occurred which were collateral to the dominating hierarchy of conception in that they represented a deviating view of the content.

The changes occurring in the conception of cognitive content between the reading of the text and a subsequent occasion were of the same kind as the difference between students on one and the same occasion. Changes of conception by the later occasion implied a lower level on the later occasion. The fundamental nature of the qualitative differences is further substantiated by the analysis of study skill (presented below).

Summing up, we may say that a description of qualitative differences in the conception of content has been found to be the most fruitful way of describing knowledge. The best way of observing such differences has been found to be that of starting with an analysis of the variation between persons and description, i.e. the analysis must be explorative. (Questions of method have been specifically dealt with in reports 1, 13, 16, and 21.)

2. How can study skill be observed and described

The answer to the first question provides part of the answer to this question as well. Study skill has been interpreted as the combination of an activity in relation to a situation and the outcome of that activity in the form of knowledge. The concept of study skill has been analysed mainly in relation to the non-experimental studies of the first two years (including the learning experiment conducted during the first year). The students' descriptions of their cognitive attitude during learning (how they thought) provided the foundation for an analysis of qualitative differences in that activity. The subjects could then be grouped into two categories representing different attitudes towards the content dealt with in the texts. These attitudes were very clearly related to the outcome of learning, one of them being combined with higher levels and the other with lower levels. This agreement confirms the relevance of the descriptions of cognitive activity and of the attitudes. (These analyses have been presented in reports 11, 13, and 21.)

The attitudes were generally discussed in terms of deep level and surface level processing or holistic and atomistic approach to the content of a text. The analyses of the learning experiment yielded the following main results. The cognitive attitude was the superordinate aspect of learning activity in the sense that this attitude bore a governing and organizing relation to other aspects of learning activity. Holistic approach was also positively related to more quantitative measures of knowledge (knowledge concerning parts of the text). Attitude, not retention of the "content" of previous learning (the first text), was the decisive factor in the relearning of the "same" content (the second text). (These analyses are presented in report 21.)

Data concerning normal studies from the first two sets of material were also analysed with reference to cognitive attitude and indications of two attitudes were found here as well. There was also a close connection between attitude and a pass for the entire course (within one term and one year respectively) (reports 11 and 21). Further analysis of the relation to other aspects of study activity

and of differences between courses and subjects showed this connection to be an indirect one. It was established that examinations did not demand a holistic approach and that poor study activity in the sense of little time for studies, a small amount of set reading accomplished, poor preparation for examinations and, in many cases, omission to sit for examinations, was a likelier explanation of study failure.

There appeared to be two main preconditions of poor study activity, viz a difficult situation providing poor opportunities of study and/or an incorrect cognitive attitude (surface level processing/atomistic approach). Those with an inferior cognitive attitude could perhaps pass individual examinations, but their study activity steadily deteriorated. This was taken to imply that the study situation (the set reading) made such demands on the students (even if the examinations did not) that it was very difficult for them to cope with their studies if they lacked deep level processing/a holistic approach. This inference was substantiated by the relation between the qualitative and quantitative outcomes of the learning experiment. At the same time it was observed that the cognitive attitude was the most fundamental aspect of study skill, even when allowance had been made for differences between the academic subjects involved, and that this had clearly not been realized in university education or at earlier educational levels. (These analyses are presented in report 21.)

Where applicable, the model of observing and describing study skill was the same as in the observation and description of knowledge (presented under point 1). Moreover, the use of variables and statistical analyses based on variables was found to be inappropriate. The study skill analyses were analyses of combinations and patterns of data within individuals and comparisons of individuals as "total" units in order to provide a basis for the interpretation of data (report 21).

3. How can study skill be influenced?

Four experimental attempts were made to influence cognitive attitude. Two of the experiments were conducted within the second collection of data (see above) (reports 12 and 14). One of these (report 14) showed how questions following part of a Political Science passage led the students to focus their attention on the superficial structure of the text instead of its contentual structure. The questions concerned the main content of the section and the relation of that content to the content of previous sections, but the subjects learned and recited the main points and relations without going into the content.

The second experiment (report 12) involved a more general form of influence (i.e. one not dependent on content) via instructions for the reading of a passage. The students were given three chapters of an Economics textbook to read at home. The experimental group received instructions aimed at inducing deep level processing/a holistic approach, and their superior performance was interpreted as an expression of influence affecting both the orientation of their attention and its level or strength.

The last two collections of data are described in separate reports (Nos. 19 and 20). Both the experiments described above under the heading "Collections during 1972/73" led to relatively moderate but quite distinct differences between the groups involved in the experiments with regard to conception of content (differences of level). In one experiment (report 19) there were not only differences in the conception of content but also a clear difference in linguistic orientation. The group given "questions of fact" after the first two chapters answered the questions on the third chapter in a manner which bore a closer resemblance to the style of the set passage.

The second experiment yielded several interesting results besides the general difference in cognitive level. The difference in cognitive level which was obtained was selective, i.e. it was obtained for a certain content but not for another. This was taken to imply that it was easier to influence cognitive attitude vis à vis "new" content than in relation to content which seemed familiar. In the latter case, previous knowledge-previous understanding would be an obstacle. The instructions and text preparation used had a negative influence on the learning of the set passage, but they had a positive influence on subsequent learning when the corresponding conditions did not apply. The conditions employed seemed to disturb learning, at the same time as they presented the cognitive attitude in the guise of a problem, which was beneficial to continued learning.

Taken together, the experiments convey the following picture. It is easy to influence the orientation of attention, especially in a negative direction, i.e. towards the superficial structure of the text. It is easy to induce people only to learn the outward structure of a text content or to pay attention to the phraseology as well as to the content. It is also easy to get people to concentrate on details and/or parts of the text. There is also a great danger of effects of this kind resulting from attempts at influence which are made with precisely the opposite intention.

By contrast, cognitive attitude in the sense of a person's way of [illegible]ning a learning situation appears to be far more difficult to in[illegible]nce. When influence did not lead to a disregard of content or selective concentration on parts of the content, so that the learning task remained complete and undivided, the resultant effects were considerably smaller. The students tended to orientate either towards the whole or towards the parts (and the whole as the sum of the parts), and to a very great extent this tendency operated independently of attempts at influence. At the same time it is possible, if an intensive effort is made, to achieve this kind of influence within a short period.

The results of the experiments agree with and corroborate the earlier description of study skill. In view of the superordinate character of the cognitive attitude, it is probably quite difficult to influence (beyond putting it hors de combat). At the same time, other aspects of the previous knowledge possessed by the students (conceptual knowledge, for instance) doubtless contributed to the

high stability obtained in the definition of the learning situation. The great efforts made to design learning materials in a manner which governs the direction of attention appear, in the light of the results described here, to be extremely dubious. There is an obvious danger of negative effects. Work on the design of material must be combined with studies of the activity of individuals in relation to that material. Attempts to influence the study activity of students solely by means of general hints on study technique must also be regarded as inadequate, because they fail to take into account the most essential aspects of study skill.

The answer to the third question is that the best way of influencing study skill is by influencing the cognitive attitude during the learning process. The development of study skill must proceed in close relation to the treatment of the content of learning as a part (in fact the most important part) of a person's cognitive development. To ease the development of study skill and of better understanding of content, forms of study have to be created which centre on these aspects of learning.

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